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PI IN ASIA.

By PROFESSOR GEORGE BRUCE HALSTED, Greeley, Colorado.

In Tokyo at the Buddhist temple of Sengakuji lie buried the forty-seven Ronin, the national heroes of feudal Japan. Just within the gate, in a two-storied building, swords, armor and other relics of these heroes are shown on payment of a fee. By the side of the path leading to the tombs is a well with the inscription, "Here they washed it." No one in Japan needs to be told that "*it*" was the bloody head they were bringing to the grave of their lord, that dead master for whom they considered it the highest privilege thus to forfeit all their lives. The popular reverence for these heroes is still attested not only by the incense perpetually kept burning before their tombs but in stranger fashion by the fresh visiting cards constantly left upon their graves.

All the world knows their exploit, but who knows that one of them, Shigekiyo Matsumura, was the greatest Asiatic mathematician of his age, who in his work *Sanso,* published in 1663, calculated the length of one side of a regular inscribed polygon of 32768 or 2^{15} sides, obtaining

$$0.00009587379865531348З$$

and thence for the value of pi 3.141592648, which is true to seven places of decimals, to eight significant figures, while seven is the greatest number that can be obtained by any measurement whatsoever of the most modern science. He also, among many other things, evaluates the volume of the sphere, and treats fully the problem of magic squares, describing the solution of the case where the first 19^2 numbers are arranged in the form of a square. He also treats an analogous problem, not rediscovered in Europe, which may be called the problem of magic circles. solving the case where the number of diameters and the number of circles are eight and sixteen, respectively.

In Europe in 1585 Adriaan Anthoniszoon, father of Adrian Metius, gave for pi 355/113=3.1415929. But this, the most extraordinary of all fractional values, had come a whole millennium earlier in Asia. Yoshio Mikami, under date of January 13, 1908, writes me:

"I have just finished by translation of your *Rational Geometry* (309 pages). To your historical note on pi I have added the following words:

At the end of the Three Kingdoms Lin Huy of Wei gave for pi 157/50=3.14. Two centuries afterwards Tsu Chung-tse (425-499) gave the value 355/113. In Japan Seki Kowa employed the same value of pi as Tsu, and this value was given in a printed book of his day."